Report on documents prepared by the National Marine Fisheries Service on the management of bottlenose dolphins in the mid-Atlantic, prepared for the Center of Independent Experts.

A. Rus Hoelzel

Overview:

The scope of the work being undertaken or proposed for the development of management strategies for the mid-Atlantic bottlenose dolphins seems reasonably inclusive. The quality of the science is also quite high. Following discussions during a conference call and the review of one late document, I feel encouraged that some of the problems identified in the review materials, and discussed below, will be addressed in future. However, my review has been based primarily on the materials I have at hand. I concur with the scientists at NMFS that there remains considerable work to do, though I also feel that many of the suggested interpretations are likely to hold up after further research. I have some concerns about the designation of stocks in the coastal population, which as I discuss below, will need to be carefully assessed on the basis of further work, much of which is apparently ongoing or planned

Fisheries interactions:

1) The manuscripts on stranded dolphins (section 5 of the review documents: Palka et al. 25 June 01; Hohn & Martone 6 July 01; Hohn et al. 1 Nov 01), together with the draft and published summaries (section 1), all present data tables that divide stranded animals into those with evidence for 'fisheries interaction', other human interaction, no human interaction, and 'CBD' (could not be determined). The implication of these tables is that 'fisheries interaction' relates to causation with respect to mortality. During the conference call I was told that these data were not used to quantify impact, and that a direct relationship between interaction and mortality was not implied. However, some of the text in the review documents needs to be clearer on these points, for example:

> All animals are examined to determine the cause of death. Physical evidence of entanglement or other human interactions was looked for using the protocols documented in Haley and Read (1993) and Read and Murray (2000). Physical evidence of entanglements includes: line or mesh on the body, impressions of net material in the epidermis, thin lacerations on appendages or in and around the mouth, and mutilations which includes dismemberment and longitudinal cuts along the ventral abdomen into the body cavity (Palka et al. 25 June 01)

The caption to Figure 8 of this same document is more explicit: ". . . fishery interaction cause of death (B)".

The analyses that compare CBD with fisheries activities to test for a significant correlation also seem to imply that the non-CBD samples (either evidence of fisheries interaction, human interaction or no evidence of human interaction) are already determined with respect to cause of death. It should be stated clearly that evidence such as line or mesh on the body or impressions from nets on the epidermis need not be related to the cause of death, as these may have been non-lethal interactions, or the interactions could have been post-mortem. In this context it may be useful to run the correlations with fishing activity for all categories together (perhaps with the exception of the 'no human interaction' category, although this cannot, of course, be strictly determined given the potential for indirect causative interactions, such as pollution). However, given this caveat, these correlations, and especially the comparisons of the timing of all strandings with the seasonal fishing effort for different types of fishing, are interesting and seem to support the data from observed takes indicating a significant impact.

2) It would be easier to interpret the results if the data for each region were analysed and presented in the same ways.

3) I didn't find anything in the summaries or manuscripts on the data from stomach contents and stable isotope assessment of diet that would relate to potential competition with fisheries. There was a specific question about food habits in the ASRG review (section 2): "Does Barros have any relevant food habits data from beached animals", but the question doesn't seem to have been addressed directly. This is certainly an important consideration with respect to many marine mammal management programs, and probably deserves further attention for this species as well.

Abundance estimates:

1) The ASRG report identified the assumption of $g(0) = 1$ as a potential problem and recommended that explicit efforts be made to estimate $g(0)$ in future, and thereby reduce the expected negative bias. A preliminary estimate (Garrison and Hoggard; 22 Feb 2002) has now been provided for sighting transects undertaken in January and February of 2002 from Virginia to South Carolina. The method used (employing two independent teams on the same aircraft) addressed only the question of perception bias. In this trial, both teams saw 82 groups of dolphins, but team 1 saw 15% more that team 2 didn't see, and team 2 saw 26% more that team 1 didn't see. So on average, each team saw about 20% extra groups not seen by the other team. This resulted in an adjustment on the final population estimate of only 0.3%, and on this basis $g(0)$ was estimated as $g(0) = 1$. The details of how this was calculated are not presented, however, and this would certainly be useful for the next review team and anyone else wanting to assess these analyses in future. The estimator described by Palka (1995) is presented, but using this calculation to compare N-hat with N-both (2232 vs. 1550 using the stated average group size of 18.9), there seems to be a substantial difference between the confirmed sighting number (N-both – a minimum) and the estimate.

2) The question of g(0) and the implications for abundance estimates was taken up as a concern in a letter by Rick Marks to the House Resources Committee. In addressing the concerns raised in this letter, William Hogarth representing NMFS pointed out that group sizes were on average 18.4 to 21.4 during the 1995 summer (MATS) survey and only 1.4 to 10.7 during the 1995 winter (SECAS) survey. Therefore, he argued, g(0) was likely close to 1 for the summer (northern) survey, but may be lower for the winter (southern) survey. This speaks to the question of the availability of animals to the survey, on the assumption that smaller groups are harder to see. However, the argument that larger groups seen in the northern survey implies g(0) should be 1 seems somewhat circular to me. What if for some reason small groups are harder to see in the northern surveys? That they are in fact missed during the standard survey at 229m was implied by results of the NE surveys which ran at 183m and sighted many more small groups over the same geographic range as the MATS surveys. The question of animals available to the survey will need further attention before a secure estimate of g(0) can be achieved. Perhaps it will be interesting to look at the data from Garrison and Hoggard (22 Feb 2002) to see if group size tended to be smaller for the extra 15-26% sightings seen by one team and not the other.

3) The issue of negative bias is considered in some depth by the ASRG review and the NMFS scientists themselves. However there is less discussion about potential positive biases, for example, the question of re-sightings of the same groups. Presumably re-sighting bias is taken into consideration, but I didn't manage to find reference to the method. The preliminary report by Garrison and Hoggard (22 Feb 2002) on the winter 2002 mid-Atlantic line-transect survey provides a new abundance estimate for this region. The estimate of 21,939 animals for the nearshore transects is considerably higher than the 1995 estimate of 4,734 over a similar geographic range. The 1995 estimate is for North Carolina, and the 2002 estimate is for Virginia Beach, VA to Murell's Inlet, SC, but most sightings in 2002 were said to be concentrated from Cape Hatteras to Cape Lookout, NC. An important difference between the surveys was the distance between the track lines - up to 20km between tracks in 1995 and 2-5km between tracks in 2002. Garrison and Hoggard suggest that this may have permitted the detection of 'patches of animals' that had been missed in the earlier survey. However, these are highly mobile animals, and I wonder if an increased re-sighting rate may be a more important reason for the dramatic increase in the estimated number of dolphins in this region.

4) Surveys along the mid-Atlantic coastal region are complicated by the presence of two genetically distinct stocks, one inhabiting primarily offshore habitat, and the other primarily nearshore habitat. The fact that these are separate stocks seems well established. Their geographic distribution is less clear, and since they can't be distinguished from the air, there is the possibility that animals from one stock may be counted among the numbers of the other. One approach to address the problem is to identify the limits of range overlap. Researchers at NMFS have attempted to do this using genetic markers, so that the probability of finding animals from a given stock can be related to parameters such as depth or distance from shore (described in section 6). However, to date, the number of samples acquired in the intermediate geographic range, are too few to provide a useful estimate of

the degree of mixing in this region. Samples from animals close to shore were dominated by haplotypes representing the nearshore lineage, but there were some exceptions. I suspect that while the habitat requirements of the two morphotypes will maintain geographic isolation much of the time, local and temporal differences will mean that they are sympatric during some aspects of the surveys. In other words, this may be a dynamic interaction, with the stocks mixing sometimes and not other times. This should be tested with further genetic analyses (as planned), but it would also be worth investigating possible means to differentiate between nearshore and offshore morphotypes from the air. This may be possible on the basis of behaviour, respiration rate, even thermal imaging, or some combination of these.

Stock Structure:

Genetics

1) An important factor in the new designation of management units is the population genetic assessment. This was based on mtDNA (HVR1 of the control region) and microsatellite DNA markers. The results presented in section 6 (part 2.1) show the pattern of mtDNA differentiation among four putative populations based on F_{ST} (as implemented using the program AMOVA). These data seem to suggest significant differentiation between all four putative populations (Virginia, Southern NC, Charlestown, SC, & Jacksonville, FL). However, this needs to be considered in context, and most of the needed information wasn't provided in this short review. Some additional information was provided during the conference call. During that call the PI for the genetic work (Patricia Rosel) confirmed that the overall level of diversity among nearshore animals was very low for the mtDNA markers. This is consistent with my published (Hoelzel et al. 1998) and unpublished results. There are several consequences. First, the effective size of populations will be very low with respect to this marker, which makes it more likely to show the effects of drift. Second small sampling biases could have a large impact on the apparent population structure. It also means that haplotypes introduced through immigration may have a disproportionately large impact on the apparent population structure. It is likely that the Florida-New Jersey and other regional coastal populations in the western North Atlantic are based on relatively small maternal founder populations (Hoelzel et al. 1998). Further, among samples from Georgia to Virginia we found evidence of divergent matrilines that matched the lineages from the Gulf of Mexico and the Bahamas, suggesting their introduction through immigration. However, females are likely to be mostly philopatric in this species (as in many mammalian species), and recent introductions of divergent matrilines could produce significant patterns of differentiation that don't mean very much in terms of long-term patterns of gene flow. Comparing F_{ST} with geographic distance doesn't seem to provide any correlation (though I only looked at this roughly based on the data provided), and this too suggests a pattern that may not be related to the long-term establishment of regional matriline structure. Taken together, these factors make the assessment of genetic structure using mtDNA alone difficult. Therefore,

while the mtDNA data is interesting, it doesn't convince me that these putative populations are genetically isolated. Polymorphic, sexually recombining markers (e.g. microsatellite DNA loci) are needed.

2) Microsatellite loci were investigated, but no data are provided in the summary on the number of loci, the level of polymorphism, or the pattern of genetic structure revealed (or the tests used to assess that structure). From the conference call I learned that 8 loci had been investigated, that they were polymorphic, and that they indicated significant population structure. I would need further details to assess the implications of these data, but can say for now that 8 polymorphic loci should be sufficient, and that structure determined on the basis of these loci would substantially improve the case for isolated genetic stocks (given no evidence of linkage disequilibrium or significant deviation from Hardy-Weinberg expectations - which could imply null alleles). However, I would expect the level of differentiation to be low (F_{ST} of 0-0.08 was suggested over the phone). An F_{ST} of 0.08 implies that 8% of the variance is accounted for by differences between populations (92% would be accounted for by variation within populations). The Hardy-Weinberg test could also be used to help assess population structure through testing the expectations of the Wahlund effect. I found the report of significant structure based on microsatellite loci a bit surprising given the results of a similar study we have undertaken on putative coastal populations in South Africa, but it could certainly be the case that the pattern of structure differs between these two regions. Further to the RHO_{ST} analyses indicated from the conference call, I think assignment tests would be useful to assign genotype to region. The microsatellite DNA data could also be used to inform the choice of samples towards avoiding kinship bias in the population comparisons (e.g. using the program KINSHIP to estimate coefficients of relatedness). Both microsatellite DNA and mtDNA data should be incorporated into a hierarchical F_{ST} analysis (e.g. using ARLEQUIN) to test the geographic boundaries of the putative stocks.

3) Relatively minor point (referring now to the draft summary in section 1), but Dowling and Brown (1993) were actually the first to demonstrate a significant genetic difference between Gulf of Mexico and Eastern Seaboard bottlenose dolphins (not Curry 1997). In general it would be useful if fewer unpublished and/or unobtainable references were relied on, especially when published material is available, though I appreciate that some relevant material can only be found in unpublished sources.

Stable Isotopes

1) $\delta^{18}O$ ratios were derived from powdered teeth, which will give a value averaged over the dolphins lifetime, as suggested in the text (section 6, Part 2.2), but this will likely be biased towards a representation of the early period of growth, when most of the dentin is laid down. Differences in habitat use with age could affect the results, and so it may be interesting to investigate this result in the context of age. Preliminary results were suggested to indicate some correlation with genetic differentiation, though (based on the conference call) there are apparently too few samples to make anything of this for now.

However, it will be an interesting line of analysis, especially if the $\delta^{18}O$ marker is used to identify animals from one of the management units. Note that the temporal scale will differ though if both stable isotope and genetic data are derived from tissue samples as proposed. The turnover in skin will mean that stable isotope ratios will only reflect recent environmental factors.

2) It would be useful to compare C and N isotope markers for geographic variation. Again according to the conference call, this was investigated and no pattern was detected over a geographic range from Virginia to South Carolina. This may be interesting in comparison with the $\delta^{18}O$ results, since the prey base would likely be different within the estuarine compared to the coastal marine environment, so some correlation with the $\delta^{18}O$ results may have been expected if these animals were spending most of their time in these different environments.

Photo-ID

1) These data seem to form the foundation of the management unit designations, and they do seem to convincingly imply some restriction in the movement of animals among some of these regions, at least over the temporal scale investigated. However, it is important to note that rather little migration is necessary to make populations essentially panmictic with respect to genetic structure (for sexually recombining loci - i.e. nuclear genes). It is also true that physical movement from one population to another does not necessarily imply gene flow. Therefore, confirmation of stock structure with genetic markers will remain a key aspect of the management unit classification.

2) Some of the units seem to be based on restricted or limited photo-ID data. For example, as far as I can tell the Georgia unit is based only on photographic data from coastal waters near Savannah. The Central Florida Management Unit also seems to be based on very limited photographic data. The northern units are not clearly designated by photo-ID data, because there is fairly extensive movement between them. It should also be noted that from a 'stepping stone' perspective, all of the putative management units (with the exception of Central Florida) are connected by photo-ID matches (see section 6, Figure 9). This could be important if it also meant continuity of gene flow. More data on the relative proportion of within vs. between area re-sightings would help define the management units.

3) Matches between photo-ID and genotyping will be very useful and should be pursued in future (as is planned). These samples should be routinely sexed to assess any bias in the movement of males and females.

<u>Conclusions</u>:

Management of bottlenose dolphins in the mid-Atlantic region presents a complex, multi-faceted problem. Researchers at SE-NMFS are undertaking a thorough program of research to address this problem, and responding to difficulties in the interpretation of their data by

modifying their approach. This certainly seems to be the best way forward. Specific questions that still need to be addressed are suggested above, but planned work seems likely to address many of these problems. My overall impression is that this management program is in very good hands.

References

Dowling, T. E., and W. M. Brown. 1993. Population structure of the bottle-nosed dolphin (Tursiops truncatus) as determined by restriction endonuclease analysis of mitochondrial DNA. *Mar. Mammal Sci.* 9 (2): 138-155.

Hoelzel, A.R., Potter, C.W. & Best, P. 1998. Genetic differentiation between parapatric 'nearshore' and 'offshore' populations of the bottlenose dolphin. *Proc. Royal Soc. B.* 265:1-7.

Appendix I: Statement of Work

STATEMENT OF WORK

CONSULTING AGREEMENT BETWEEN THE UNIVERSITY OF MIAMI AND DR. A. RUS HOELZEL

March 12, 2002

GENERAL[1]

THE MARINE MAMMAL PROTECTION ACT REQUIRES THE NATIONAL MARINE FISHERIES SERVICE (NMFS) TO DEVELOP AND IMPLEMENT A TAKE REDUCTION PLAN TO ASSIST IN THE RECOVERY OR PREVENT THE DEPLETION OF STRATEGIC STOCKS OF MARINE MAMMALS THAT INTERACT WITH COMMERCIAL FISHERIES THAT FREQUENTLY (CATEGORY I) OR OCCASIONALLY (CATEGORY II) CAUSE INCIDENTAL MORTALITY OR SERIOUS INJURY TO MARINE MAMMALS. TAKE REDUCTION TEAMS ARE CONVENED TO DEVELOP DRAFT TAKE REDUCTION PLANS, WHICH ARE IMPLEMENTED BY NMFS THROUGH REGULATIONS. TAKE REDUCTION TEAMS CONSIST OF REPRESENTATIVES FROM THE COMMERCIAL AND RECREATIONAL FISHING INDUSTRY, CONSERVATION GROUPS, FEDERAL AND STATE GOVERNMENT, FISHERY MANAGEMENT COUNCILS, INTERSTATE FISHERIES COMMISSIONS, AND ACADEMIC AND SCIENTIFIC ORGANIZATIONS.

THE IMMEDIATE GOAL OF A TAKE REDUCTION PLAN IS TO REDUCE, WITHIN 6 MONTHS OF IMPLEMENTATION, THE INCIDENTAL MORTALITY OR SERIOUS INJURY OF A MARINE MAMMAL STOCK FROM COMMERCIAL FISHING OPERATIONS TO A SUSTAINABLE LEVEL, REFERRED TO AS THE POTENTIAL BIOLOGICAL REMOVAL LEVEL. THE TAKE REDUCTION PROCESS IS CONTENTIOUS, BRINGING TOGETHER PEOPLE WITH VERY DIFFERENT PERSPECTIVES TO DEVELOP A CONSENSUS-BASED APPROACH FOR REDUCING MARINE MAMMAL MORTALITY INCIDENTAL TO COMMERCIAL FISHING. THE INTENT IS TO DEVELOP A MANAGEMENT PROGRAM THAT MEETS CONSERVATION GOALS AND MINIMIZES THE POTENTIAL IMPACT ON THE FISHING INDUSTRY.

THE BOTTLENOSE DOLPHIN TAKE REDUCTION TEAM (TEAM) WAS CONVENED IN NOVEMBER OF 2001 TO ADDRESS MORTALITY OF THE WESTERN NORTH ATLANTIC COASTAL STOCK OF BOTTLENOSE DOLPHINS INCIDENTAL TO NINE CATEGORY II COMMERCIAL FISHERIES THAT OCCUR ALONG THE EAST COAST OF THE UNITED STATES. THE WESTERN NORTH ATLANTIC COASTAL STOCK OF BOTTLENOSE DOLPHINS IS A STRATEGIC STOCK. STRATEGIC STATUS WAS INITIALLY ASSIGNED BECAUSE THE STOCK IS DESIGNATED AS DEPLETED UNDER THE MARINE MAMMAL PROTECTION ACT AS A RESULT OF A LARGE-SCALE MORTALITY EVENT THAT OCCURRED IN 1987-1988. HOWEVER, THE STOCK ALSO QUALIFIES TO BE STRATEGIC BECAUSE MORTALITY AND SERIOUS INJURY INCIDENTAL TO COMMERCIAL FISHING EXCEEDS SUSTAINABLE LEVELS.

THE DATA USED IN THE ANALYSES CONDUCTED TO DEVELOP STOCK STRUCTURE, ABUNDANCE, AND FISHERY-RELATED MORTALITY INFORMATION FOR USE BY THE TEAM ARE NOT FINAL AND WILL CONTINUE TO BE SUPPLEMENTED BY RESULTS FROM ONGOING RESEARCH EFFORTS. THE DOCUMENTS SUBMITTED FOR REVIEW HAVE ALREADY BEEN PEER-REVIEWED BY THE ATLANTIC SCIENTIFIC REVIEW GROUP THROUGH A SYSTEM ESTABLISHED BY THE MARINE MAMMAL PROTECTION ACT. MEMBERS OF THE SCIENTIFIC REVIEW GROUPS ARE INDIVIDUALS WITH EXPERTISE IN MARINE MAMMAL BIOLOGY AND ECOLOGY, POPULATION DYNAMICS AND MODELING, AND COMMERCIAL FISHING TECHNOLOGY PRACTICES.

AS REQUIRED BY THE MARINE MAMMAL PROTECTION ACT, NMFS HAS CONVENED THE TEAM AND MUST USE THE BEST AVAILABLE INFORMATION TO SUPPORT THE TEAM. ALTHOUGH THE TEAM IS REQUIRED BY THE MARINE MAMMAL PROTECTION ACT TO SUBMIT A DRAFT TAKE REDUCTION PLAN TO NMFS IN MAY OF 2002, THEIR INVOLVEMENT IN THE PROCESS DOES NOT END AT THAT TIME. TAKE REDUCTION TEAMS CONTINUE TO

[1] See Attachment A for definitions of the following terms: strategic stock, potential biological removal level, depleted, optimum sustainable population, and fishery classifications (Category I, II, and III fisheries).

MEET WITH NMFS ON A REGULAR BASIS TO MONITOR PLAN IMPLEMENTATION AND RECEIVE NEW INFORMATION RESULTING FROM ONGOING RESEARCH EFFORTS. AT THESE MEETINGS, THE TEAM HAS THE OPPORTUNITY TO MAKE RECOMMENDATIONS TO REVISE THE REGULATIONS. ATTACHMENT B SHOWS THE CHRONOLOGY OF EVENTS RELATED TO CONVENING THE TEAM.

SPECIFIC

EACH REVIEWER SHALL ANALYZE SEVEN DOCUMENTS ADDRESSING BOTTLENOSE DOLPHIN STOCK STRUCTURE, ABUNDANCE ESTIMATES, AND MORTALITY ESTIMATES (TASK 2, ITEMS A-G). THE SEVEN DOCUMENTS REPRESENT AN INTERIM APPROACH TO BOTTLENOSE DOLPHIN SCIENCE. NMFS RECOGNIZES THAT THEY PRESENT WORK IN PROGRESS (E.G., STOCK IDENTIFICATION), *A POSTERIORI* ANALYSIS OF PREVIOUS DATA SETS USING NEW STOCK STRATA (E.G., SOUTHEAST SURVEYS FOR ABUNDANCE), AND, IN SOME CASES, LIMITED SAMPLE SIZES. HOWEVER, THIS INFORMATION IS A SIGNIFICANT IMPROVEMENT OVER THE INFORMATION AVAILABLE PRIOR TO THE COMPILATION OF THESE DOCUMENTS AND, THEREFORE, PROVIDES MORE APPROPRIATE RESULTS FOR USE BY THE TEAM. EACH REVIEWER SHALL REVIEW THESE DOCUMENTS IN THAT CONTEXT.

THE REVIEWERS SHOULD FOCUS ON THE FOLLOWING ISSUES WHEN WORKING ON TASK 2:

- ARE THE DATA USED APPROPRIATELY?
- ARE THE ANALYSES CONDUCTED APPROPRIATE?
- ARE THE DATA ADEQUATE FOR THE ANALYSES CONDUCTED?
- ARE ASSUMPTIONS INHERENT IN THE ANALYSES APPROPRIATELY CONSIDERED?
- ARE THE INTERPRETATIONS OF THE DATA AND ANALYSES APPROPRIATE?

ADDITIONALLY, THE REVIEWERS SHALL PROVIDE SUGGESTIONS FOR ALTERNATIVE METHODS FOR ANALYZING OR INTERPRETING THE INFORMATION, WHERE BETTER METHODS EXIST. EACH REVIEWER SHALL CONCLUDE, IN A WRITTEN REPORT, WHETHER THE ANALYSES REPRESENT THE BEST ANALYSIS OF THE AVAILABLE INFORMATION.

EACH REVIEWER'S DUTIES SHALL NOT EXCEED A MAXIMUM TOTAL OF SEVEN DAYS, INCLUDING SEVERAL DAYS FOR DOCUMENT REVIEW, SEVERAL DAYS TO PRODUCE A WRITTEN REPORT OF THE FINDINGS, AND SEVERAL HOURS FOR A CONFERENCE CALL. NO TRAVEL IS REQUIRED, AND THEREFORE EACH REVIEWER MAY PERFORM ALL REVIEW, ANALYSIS, AND WRITING DUTIES OUT OF THE REVIEWER'S PRIMARY LOCATION. A CONSENSUS REPORT IS NOT REQUIRED.

THE CENTER OF INDEPENDENT EXPERTS (CIE) SHALL SCHEDULE AND FACILITATE A CONFERENCE CALL WITH THE REVIEWERS AND NMFS SCIENTISTS AND MANAGERS TO PROVIDE AN OPPORTUNITY FOR THE REVIEWERS TO ASK QUESTIONS ABOUT THE SCIENCE AND THE TAKE REDUCTION PROCESS PRIOR TO THE REVIEWERS WRITING THEIR REPORTS AS DETAILED UNDER TASK 4 AND ANNEX I. THE AGENDA FOR THE CONFERENCE CALL SHALL CONSIST OF: 1) GENERAL/PROGRAMMATIC ISSUES; (2) QUESTIONS SPECIFIC TO EACH DOCUMENT LISTED IN TASK 2. THE CIE SHALL PROVIDE A TOLL-FREE PHONE NUMBER FOR THE CONFERENCE CALL. IDEALLY, ONE CONFERENCE CALL WILL BE HELD WITH ALL OF THE REVIEWERS. HOWEVER, MORE THAN ONE CONFERENCE CALL MAY BE ARRANGED IF ALL OF THE REVIEWERS ARE NOT AVAILABLE AT THE SAME TIME.

THE ITEMIZED TASKS OF EACH REVIEWER INCLUDE:

TASK 1: SURVEYING THE FOLLOWING SUPPLEMENTARY INFORMATION PROVIDED TO EACH REVIEWER PRIOR TO COMPLETING TASK 2 FOR ADDITIONAL CONTEXT AND BACKGROUND ABOUT BOTTLENOSE DOLPHINS, THE TAKE REDUCTION PROCESS, AND THE ATLANTIC MARINE MAMMAL SCIENTIFIC REVIEW GROUP REVIEW. THE REVIEWER SHOULD NOT ANALYZE THESE DOCUMENTS FOR THE WRITTEN REPORT.

THE FOLLOWING TWO DOCUMENTS PROVIDE AN OVERVIEW OF BOTTLENOSE DOLPHIN SCIENCE, AS PRESENTED IN NMFS STOCK ASSESSMENT REPORT PUBLICATIONS. THE FIRST DOCUMENT REPRESENTS THE CURRENT STATE OF KNOWLEDGE, SUMMARIZING THE DETAILED INFORMATION CONTAINED IN THE REVIEW DOCUMENTS IDENTIFIED IN TASK 2. THE SECOND DOCUMENT IS PROVIDED TO SHOW WHAT INFORMATION WAS AVAILABLE BEFORE THE REVIEW DOCUMENTS WERE PREPARED.

- NATIONAL MARINE FISHERIES SERVICE. NOVEMBER 2001. DRAFT 2002 STOCK ASSESSMENT REPORT FOR THE WESTERN NORTH ATLANTIC COASTAL STOCK OF BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*).

- NATIONAL MARINE FISHERIES SERVICE. SEPTEMBER 2000. 2000 STOCK ASSESSMENT REPORT FOR THE WESTERN NORTH ATLANTIC COASTAL STOCK OF BOTTLENOSE DOLPHIN (*TURSIOPS TRUNCATUS*).

THE FOLLOWING TWO DOCUMENTS RELATE TO THE REVIEW CONDUCTED BY THE ATLANTIC SCIENTIFIC REVIEW GROUP, WHICH REVIEWED THE SAME OR EARLIER VERSIONS OF THE DOCUMENTS IDENTIFIED IN TASK 2.

- ATLANTIC SCIENTIFIC REVIEW GROUP REVIEW OF BOTTLENOSE DOLPHIN DOCUMENTS. OCTOBER 2001.

- NMFS RESPONSE TO THE ATLANTIC SCIENTIFIC REVIEW GROUP. NOVEMBER 2001.

NMFS GAVE TEAM MEMBERS THE OPPORTUNITY TO IDENTIFY QUESTIONS ABOUT THE DOCUMENTS IDENTIFIED IN TASK 2. ONLY ONE TEAM MEMBER PROVIDED COMMENTS. THE REVIEWERS ARE NOT REQUIRED TO RESPOND TO THESE COMMENTS.

- COMMENTS FROM ONE MEMBER OF THE TEAM FOR THE CIE PEER REVIEW. DECEMBER 2001.

THE FOLLOWING TWO DOCUMENTS IDENTIFY CONCERNS OF ONE REPRESENTATIVE FROM THE FISHING INDUSTRY ABOUT BOTTLENOSE DOLPHIN SCIENCE AND THE TAKE REDUCTION PROCESS AND NMFS RESPONSE.

- LETTER FROM RICK MARKS TO THE HONORABLE JAMES V. HANSEN AND THE HONORABLE DON YOUNG OF THE U.S. HOUSE OF REPRESENTATIVES RESOURCES COMMITTEE REGARDING THE BOTTLENOSE DOLPHIN TAKE REDUCTION TEAM PROCESS. AUGUST 2001.

- NMFS RESPONSE TO RICK MARKS LETTER TO THE HOUSE RESOURCES COMMITTEE. SEPTEMBER 2001.

THE FOLLOWING THREE DOCUMENTS PROVIDE DESCRIPTIVE INFORMATION ABOUT BOTTLENOSE DOLPHIN STRANDINGS ALONG THE EAST COAST OF THE U.S.

- PALKA, D., F. WENZEL, D. L. HARTLEY, AND M. ROSSMAN. JUNE 2001. SUMMARY OF BOTTLENOSE DOLPHIN STRANDINGS FROM NEW YORK TO VIRGINIA.

- HOHN A., P. T. MARTONE. JULY 2001. CHARACTERIZATION OF BOTTLENOSE DOLPHIN STRANDINGS IN NORTH CAROLINA, 1997-2000.

- HOHN A., B. MASE, J. LITZ, W. MCFEE, AND B. ZOODSMA. NOVEMBER 2001. CHARACTERIZATION OF HUMAN-CAUSED STRANDINGS OF BOTTLENOSE DOLPHINS ALONG THE ATLANTIC COAST FROM SOUTH CAROLINA TO FLORIDA, 1997-2000.

TASK 2: READING AND ANALYZING THE FOLLOWING DOCUMENTS (A-G) PROVIDED TO EACH REVIEWER. THIS IS THE PRIMARY TASK OF THE CONTRACT. THE REPORT IDENTIFIED IN TASK 4 AND IN ANNEX I SHOULD ADDRESS THESE DOCUMENTS.

STOCK STRUCTURE

a. NATIONAL MARINE FISHERIES SERVICE. JUNE 2001. PRELIMINARY STOCK STRUCTURE OF COASTAL BOTTLENOSE DOLPHINS ALONG THE ATLANTIC COAST OF THE U.S.

b. GARRISON, L. JUNE 2001. SEEKING A HIATUS IN SIGHTINGS FOR BOTTLENOSE DOLPHIN DURING SUMMER AND WINTER AERIAL SURVEYS. NATIONAL MARINE FISHERIES SERVICE.

ABUNDANCE ESTIMATES

C. GARRISON, L. AND A. HOHN. OCTOBER 2001. ABUNDANCE ESTIMATES FOR ATLANTIC BOTTLENOSE DOLPHINS: COMBINING STRIP TRANSECT DATA AND LINE TRANSECT ABUNDANCE ESTIMATION. NATIONAL MARINE FISHERIES SERVICE.

D. GARRISON, L. AND C. YEUNG. 15 JUNE 2001. ABUNDANCE ESTIMATES FOR ATLANTIC BOTTLENOSE DOLPHIN STOCKS DURING SUMMER AND WINTER, 1995. NATIONAL MARINE FISHERIES SERVICE.

E. PALKA, D., L. GARRISON, A. HOHN, AND C. YEUNG. 1 NOVEMBER 2001. SUMMARY OF ABUNDANCE ESTIMATES AND PBR FOR COASTAL *TURCIOPS* FOR WATERS BETWEEN NEW YORK AND FLORIDA DURING 1995 TO 2000. NATIONAL MARINE FISHERIES SERVICE.*MORTALITY ESTIMATES*

F. GARRISON, L. 2 JULY 2001. MORTALITY ESTIMATE FOR ATLANTIC BOTTLENOSE DOLPHIN IN THE DIRECTED SHARK GILLNET FISHERY OF FLORIDA AND GEORGIA. NATIONAL MARINE FISHERIES SERVICE.

G. ROSSMAN, M. AND D. PALKA. 3 OCTOBER 2001. BYCATCH ESTIMATES OF COASTAL BOTTLENOSE DOLPHIN (*TURCIOPS TRUNCATUS*) IN U.S. MID-ATLANTIC GILLNET FISHERIES FOR 1996 TO 2000. NATIONAL MARINE FISHERIES SERVICE.

TASK 3: PARTICIPATE IN A CONFERENCE CALL, TO BE ARRANGED BY CIE, WITH NMFS SCIENTISTS AND MANAGERS TO DISCUSS QUESTIONS EACH REVIEWER MAY HAVE ABOUT THE SCIENCE AND THE TAKE REDUCTION PROCESS.

TASK 4: NO LATER THAN MARCH 1, 2002, EACH REVIEWER SHALL SUBMIT A WRITTEN, NON-CONSENSUS REPORT OF FINDINGS, ANALYSIS, AND CONCLUSIONS BASED OF THEIR REVIEW OF THE DOCUMENTS (TASK 2, ITEMS A-G). THE REPORT SHOULD BE ADDRESSED TO THE UNIVERSITY OF MIAMI INDEPENDENT SYSTEM FOR PEER REVIEWS AND SENT TO DR. DAVID DIE, UNIVERSITY OF MIAMI/RSMAS, 4600 RICKENBACKER CAUSEWAY, MIAMI, FL 33149 (OR VIA EMAIL TO DDIE@RSMAS.MIAMI.EDU).

SIGNED_____ DATE_____

ANNEX I: REPORT GENERATION AND PROCEDURAL ITEMS

3. THE REPORT SHOULD BE PREFACED WITH AN EXECUTIVE SUMMARY OF FINDINGS AND/OR RECOMMENDATIONS.

4. THE MAIN BODY OF THE REPORT SHOULD CONSIST OF A BACKGROUND, DESCRIPTION OF REVIEW ACTIVITIES, SUMMARY OF FINDINGS, AND CONCLUSIONS/RECOMMENDATIONS.

5. THE REPORT SHOULD ALSO INCLUDE AS SEPARATE APPENDICES THE BIBLIOGRAPHY OF MATERIALS PROVIDED BY THE CENTER FOR INDEPENDENT EXPERTS AND NMFS AND A COPY OF THE STATEMENT OF WORK.

ATTACHMENT A
DEFINITIONS

STRATEGIC STOCK IS DEFINED IN SECTION 3(19) OF THE MMPA TO MEAN A MARINE MAMMAL STOCK, "(A) FOR WHICH THE LEVEL OF DIRECT HUMAN-CAUSED MORTALITY EXCEEDS THE POTENTIAL BIOLOGICAL REMOVAL LEVEL; (B) WHICH, BASED ON THE BEST AVAILABLE SCIENTIFIC INFORMATION, IS DECLINING AND IS LIKELY TO BE LISTED AS A THREATENED SPECIES UNDER THE ENDANGERED SPECIES ACT (ESA) OF 1973 WITHIN THE FORESEEABLE FUTURE OR (C) WHICH IS LISTED AS A THREATENED SPECIES OR ENDANGERED SPECIES UNDER THE ENDANGERED SPECIES ACT OF 1973 (16 U.S.C. 1531 ET SEQ.), OR IS DESIGNATED AS DEPLETED UNDER THIS ACT [MMPA]."

POTENTIAL BIOLOGICAL REMOVAL (PBR) LEVEL IS DEFINED IN SECTION 3(20) OF THE MMPA TO MEAN, IN RELEVANT PART, "THE MAXIMUM NUMBER OF ANIMALS, NOT INCLUDING NATURAL MORTALITIES, THAT MAY BE REMOVED FROM A MARINE MAMMAL STOCK WHILE ALLOWING THAT STOCK TO REACH OR MAINTAIN ITS OPTIMUM SUSTAINABLE POPULATION."

DEPLETED IS DEFINED BY SECTION 3(1) OF THE MMPA TO MEAN ANY CASE IN WHICH, "(A) THE SECRETARY, AFTER CONSULTATION WITH THE MARINE MAMMAL COMMISSION AND THE COMMITTEE OF SCIENTIFIC ADVISORS ON MARINE MAMMALS ESTABLISHED UNDER TITLE II OF THIS ACT, DETERMINED THAT A SPECIES OR POPULATION STOCK IS BELOW ITS OPTIMUM SUSTAINABLE POPULATION; (B) A STATE, TO WHICH AUTHORITY FOR THE CONSERVATION AND MANAGEMENT OF A SPECIES OR POPULATION STOCK IS TRANSFERRED UNDER SECTION 109, DETERMINES THAT SUCH SPECIES OR POPULATION STOCK IS BELOW ITS OPTIMUM SUSTAINABLE POPULATION; OR (C) A SPECIES OR POPULATION STOCK IS LISTED AS AN ENDANGERED SPECIES OR A THREATENED SPECIES UNDER THE ENDANGERED SPECIES ACT OF 1973."

OPTIMUM SUSTAINABLE POPULATION IS DEFINED BY SECTION 3(9) OF THE MMPA TO MEAN, "WITH RESPECT TO ANY POPULATION STOCK, THE NUMBER OF ANIMALS WHICH WILL RESULT IN THE MAXIMUM PRODUCTIVITY OF THE POPULATION OR THE SPECIES, KEEPING IN MIND THE CARRYING CAPACITY OF THE HABITAT AND THE HEALTH OF THE ECOSYSTEM OF WHICH THEY FORM A CONSTITUENT ELEMENT."

FISHERY CLASSIFICATION IS DEFINED IN SECTION 118(C) OF THE MMPA AND IMPLEMENTED BY REGULATION IN 50 CFR PART 229. THE FISHERY CLASSIFICATION CRITERIA CONSIST OF A TWO-TIERED, STOCK-SPECIFIC APPROACH THAT FIRST ADDRESSES THE TOTAL IMPACT OF ALL FISHERIES ON EACH MARINE MAMMAL STOCK AND THEN ADDRESSES THE IMPACT OF INDIVIDUAL FISHERIES ON EACH STOCK. THIS APPROACH IS BASED ON CONSIDERATION OF THE RATE, IN NUMBERS OF ANIMALS PER YEAR, OF INCIDENTAL MORTALITIES AND SERIOUS INJURIES OF MARINE MAMMALS DUE TO COMMERCIAL FISHING OPERATIONS RELATIVE TO THE PBR LEVEL FOR EACH MARINE MAMMAL STOCK.

- TIER 1: IF THE TOTAL ANNUAL MORTALITY AND SERIOUS INJURY ACROSS ALL FISHERIES THAT INTERACT WITH A STOCK IS LESS THAN OR EQUAL TO 10 PERCENT OF THE PBR LEVEL OF THIS STOCK, ALL FISHERIES INTERACTING WITH THIS STOCK WOULD BE PLACED IN CATEGORY III. OTHERWISE, THESE FISHERIES ARE SUBJECT TO THE NEXT TIER OF ANALYSIS TO DETERMINE THEIR CLASSIFICATION.
- TIER 2, CATEGORY I: ANNUAL MORTALITY AND SERIOUS INJURY OF A STOCK IN A GIVEN FISHERY IS GREATER THAN OR EQUAL TO 50 PERCENT OF THE PBR LEVEL.
- TIER 2, CATEGORY II: ANNUAL MORTALITY AND SERIOUS INJURY OF A STOCK IN A GIVEN FISHERY IS GREATER THAN 1 PERCENT AND LESS THAN 50 PERCENT OF THE PBR LEVEL.
- TIER 2, CATEGORY III: ANNUAL MORTALITY AND SERIOUS INJURY OF A STOCK IN A GIVEN FISHERY IS LESS THAN OR EQUAL TO 1 PERCENT OF THE PBR LEVEL.